## APPENDIX F

## CHANGES MADE TO DRAFT EA

The following sections of the Draft EA have been changed. Please insert the following changes in the Draft EA. The changes have either been ~~struck out~~ to remove language or <u>double underlined</u> to indicate the new language.

| | |
|---|---|
| **1. GEOLOGY AND SOIL QUALITY, STABILITY AND MOISTURE:** Are soils present which are fragile, erosive, susceptible to compaction, or unstable? Are there unusual or unstable geologic features? Are there special reclamation considerations? | **[Y]** The 17 inches of stockpiled topsoil would be used in either alternative reclamation plan. Stockpiled topsoil lacks nutrients, particularly potassium (K) and phosphorus (P), for optimal plant growth. Proper fertilization at the time of seedbed preparation will promote good plant establishment and growth, resulting in greater transpiration (less water percolating through covers) and less erosion. Irrigation with process water provides some nitrogen replenishment; otherwise nitrogen fixation is desirable. Topsoil would benefit from organic compost that introduces beneficial microorganisms as well as a food source for them and nutrients. The benefits of compost would be greatest at nonirrigated sites.<br><br>In the June 2000 bond review that approved the placement of 19 inches of waste rock with soil-like properties for subsoil in the cover system, the justification for its use was based primarily on the assumption that the subsoil material would provide a better growth medium for plants than the leach pad ore. DEQ based this conclusion on assumptions regarding water-holding capacity, potential for metals uptake and rooting depth provided by the substrate.<br><br><u>COMPARISON OF SUBSOIL TO LEACH PAD MATERIAL Physical and Chemical Data</u>: DEQ resampled the stockpiles in 2001 (see Appendix A: Kendall Mine Comparative Coversoil Evaluation and Revegetation Recommendations). A comparison of some important physical, chemical and organic characteristics between the subsoil and the leach pad ore appears below:<br><br>Texture Thallium ppm* Arsenic ppm Organic Content Fertility<br>Subsoil Loam 70-130 ppm 350-430 ppm low low N, P, K**<br>Ore Loam 130 ppm 270-370 ppm low Hi N;Low P,K<br><br>*ppm = parts per million<br>**N,P,K = nitrogen, phosphorus, potassium |

| | |
|---|---|
| | Water-holding capacity: Texture and rock content can affect the soils' ability to hold water. The texture of the currently stockpiled approved waste rock subsoil (>230,000 cy) is a loam, as is most of the topsoil at the CR Kendall Mine. Only one stockpile identified as "clayey" subsoil actually sampled as a sandy loam, which denotes a lighter texture. Texture is basically the same for subsoil and leach pad ore.<br><br>The rock content of the approved waste rock subsoil and leach pad ore do not vary appreciably. Therefore, the water holding capacity for subsoil and leach pad ore would be similar.<br><br>Metals Uptake/Potential toxicity: Elemental thallium in elevated concentrations has been identified at the site in water, mine waste and soil. Thallium is a naturally occurring metal that is found as part of the background chemical profile throughout the mineralized areas in the North Moccasin Mountains, including the CR Kendall mine site. Mining activities exposed rock surfaces that contain thallium. Water passing through the mine wastes can pick up thallium.<br><br>The source of stockpiled suitable waste rock subsoil on site is the overburden that was taken from areas around the mine pits. These stockpiles were sampled and tested for thallium and arsenic (another common element near the CR Kendall mine mineralized zones). The purpose of the sampling was to evaluate the proposed cover material's propensity to leach thallium and arsenic. Samples of leach pads 3 and 4 ore were also collected and tested for these parameters.<br><br>The arsenic and thallium concentrations in the leach pad ore are similar to those levels in the subsoil, and hence the potential for metals uptake from either medium would also be similar.<br><br>Plant Rooting Depth: Some soil characteristics that can limit available plant rooting depth include a textural break, potential toxicity and compaction.<br><br>*Textural Break:* If the textures of topsoil and subsoil vary greatly a textural break can be created which could limit rooting depth by limiting water movement from one layer into another. The topsoil to be used as cover material can be classified as a loam, similar in texture to both the subsoil and leach pad ore. The data implies that should topsoil be placed directly over leach pad ore or the approved waste rock subsoil, there would not be a contrasting textural break at the topsoil/mine waste boundary that would limit root penetration.<br><br>*Compaction:* The similarity in texture between the waste rock subsoil and the leach pad ore suggests that either material |

| | |
|---|---|
| | would behave in a similar fashion when subjected to a compaction by reclamation equipment. If compacted, heavy loams such as those prevalent at the CR Kendall mine can limit water infiltration, so measures must be taken to prevent overland flow and erosion. Contour ripping, rough microtopography, and a near-surface organic amendment will promote infiltration. To limit erosion, slopes greater than about 30% should have a rock content of 30-40%, if available.<br><br>*Potential Toxicity:* (See Metals Uptake/Potential Toxicity discussion above). The leach pad ore and subsoil are similar in metal content. Therefore, the potential toxicity would be essentially the same for either material.<br><br>*Effects of LAD Disposal of Process Valley Water on Reclaimed Acres:* In response to observations made by DEQ employees and consultants hired by DEQ in 2001, additional testing was completed on the reclaimed acres. The water from the pumpback systems has been land applied on the reclaimed acres and does not contain anything that would impact vegetation or soils. But the process valley water, which has been disposed of on the reclaimed acres, contains a relatively large amount of salts. DEQ is concerned that continued LAD of process solutions could impact reclaimed area soils and lead to limited revegetation success. Additional sampling needs to be conducted before any determination of existing or future impacts can be made.<br><br>Also, disposal of process valley water and reverse osmosis brines on the leach pad with its salt load has led to a possible but unquantified impact to the leach pad ore and may affect its use as a subsoil media. Additional testing is needed to identify the quantity of salts in the ore and the effects it could have on a reclaimed plant community as well as water quality.<br><br>Conclusions: A re-examination of material characteristics for both the stockpiled subsoil and the leach pad ore has revealed the following:<br><br>Both materials have similar texture and rock fragment content. These physical characteristics render the materials similar in their water-holding capacities.<br><br>Concentrations of arsenic and thallium are elevated in both the subsoil and the leach pad material. This is due to the naturally occurring concentrations of these two elements in the immediate geologic environment. The arsenic levels are lower in the leach pad material, while thallium concentrations are similar for both materials. Therefore, the potential for metals uptake by plants is similar for both the subsoil and the leach |

| | |
|---|---|
| | pad ore. The data suggests that the leach pad ore may contain less available arsenic for plants.<br><br>Plant rooting depth is not limited by inherent texture, potential toxicity or compaction differences between the approved waste rock subsoil or leach pad ore.<br><br>Disposal of process valley water with its relatively large salt load on the leach pads has resulted in an unquantified impact possibly affecting its use as a subsoil material.<br><br>There is no discernable environmental advantage to using the approved waste rock subsoil as part of the cover soil system based on its physical characteristics. The leach pad ore has similar and in some cases superior (lower arsenic concentrations) characteristics. The in-place leach pad ore also has more plant-available nitrogen (an important fertility component) than the stockpiled subsoil. Covering leach pads with topsoil only is slightly superior to placing subsoil materials below the cover soil (Appendix A).<br><br>In terms of chemical characteristics, the leach pad ore may have become contaminated because of the disposal of process valley water and the reverse osmosis brine on the leach pads. The salt load in the process valley water may limit the ability of the ore to provide a subsoil resource as originally thought by DEQ. Further testing is needed to quantify the potential impacts.<br><br>If the subsoil material is not used as a cover medium, it would be used as additional backfill in the Kendall and Barnes King pits. The placement of subsoil in the pits would help cover some pit highwalls, improve safety in those areas where highwalls were covered, and would potentially increase the likelihood that the mine pits would revegetate by providing a marginal growth medium for plants.<br><br>Regardless of the ultimate cover profile, certain steps would be taken during the cover placement process to enhance the growth potential of the cover cap. Cover materials would be ripped (after placement) on the contour to limit compaction, prevent erosion and promote infiltration. Rockier coversoils will be placed on slopes. Spent ore and “subsoil” stockpiles are similar, but in-place leach pad material has slightly better growth characteristics (more plant-available N) than stockpiled subsoil (See Appendix A). A good organic amendment would provide more benefits -- at lower cost – than using stockpiled subsoil. |

| | |
|---|---|
| | **[Y]** Concentrations of thallium and arsenic in both subsoil and spent ore in leach pads may contribute to increased levels of these elements in surface water and groundwater. CR Kendall is currently collecting water at four locations around the mine site via seepage collection pumpback systems. The company will continue this practice until water quality standards are met or alternative collection and treatment systems are authorized. Eliminating the subsoil component from the cover cap would not have a significant effect on water quality or quantity. The leach pad ore contains almost equal amounts of these elements.<br><br>The process valley water contains a relatively large amount of salts. Disposal of this water on the reclaimed acres may have impacted existing reclaimed acres. Further testing is needed to quantify the impacts and areas potentially impacted. Disposal of this water on the heap leach pads may have affected the spent ore's ability to act as a subsoil layer.<br><br>If the process solutions have impacted or could impact future reclamation areas then, revegetation success would be limited, erosion would increase, and more potential problems to water quality and quantity could result. |
| **4. VEGETATION COVER, QUANTITY AND QUALITY:** Will plant communities be significantly impacted? Are any rare plants or cover types present? | **[Y]** Concentrations of thallium and arsenic in both subsoil and spent ore in leach pads may contribute to increased levels of these elements in vegetation. However, sampling one of the main revegetation grasses ten years after planting at both irrigated and nonirrigated sites at the mine site identified low concentrations (<1 ppm arsenic and ≤ 3 ppm thallium) (See attached Appendix A). More monitoring of the vegetation is proposed to identify if thallium and arsenic are accumulating to levels that may be toxic to grazers on the site.<br><br>Disposal of process solutions with a relatively large salt load on reclaimed areas may impact soils, limit revegetation success and create erosion. More testing is needed to quantify present and potential future impacts to area vegetation.<br><br>The only plant communities that would be significantly affected by closure are revegetated coversoil stockpiles. No rare species or "species of special concern" are involved, and most of the revegetation consists of common introduced species. |

**25. ALTERNATIVES CONSIDERED:**

**Agency Modified Plan:** DEQ ~~has~~ evaluated the reclamation materials and recommended that the approved plan be changed to place 17 inches of topsoil only as discussed in number 1 above. The approved waste rock subsoil would only be used for other reclamation purposes such as backfilling some portions of the pits to enhance

reclamation of those areas. DEQ ~~would~~ also required monitoring of the vegetation over time to identify if harmful levels of thallium and arsenic are accumulating in the reclaimed area vegetation. This ~~is~~ was the preferred alternative. Based on public comments received on the Draft EA and further testing by DEQ during the summer of 2001, DEQ has concluded that further analyses are required and a wider range of reclamation alternatives and water treatment techniques are needed.

**MAGNITUDE AND SIGNIFICANCE OF POTENTIAL IMPACTS:** The impacts from the agency modified reclamation plan evaluated in the Draft EA would result in slightly improved reclamation on the site, which may be inadequate to prevent long-term impacts to soil, vegetation and area water resources. Disposal of process valley solutions with the relatively large salt load may impact soils, vegetation, water quality and quantity and increase erosion. Impacts may be potentially significant.

**29. CUMULATIVE EFFECTS:** ~~No~~ Potentially significant cumulative effects on area resources from the combined current and reasonably foreseeable activities in the area are projected. A complete reevaluation of potential reclamation materials on the site is needed to identify potential impacts from disposal of process solutions with a relatively large salt load. An EIS is needed to address the soil, vegetation, and water resources effects from this salt load and its effects on CR Kendall's proposed amended water management plan. No water from the site would be released unless it meets standards set by DEQ in an Administrative Order or MPDES permit.

**30. RECOMMENDATION FOR FURTHER ENVIRONMENTAL ANALYSIS:**

**[X] EIS [ ] More Detailed EA [~~X~~] No Further Analysis**